



science for a changing world



Great Lakes Science Center

State of the Lake Huron Prey Fish Community in 1999: Progress toward Fish Community Objectives

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Prey Objective

“Maintain a diversity of prey species at population levels matched to primary production and to predator demands”

Source: DesJardine, R.L., T.K. Gorenflo, R.N. Payne, and J.D. Schrouder. 1995. *Fish-Community Objectives for Lake Huron*. Great Lakes Fish. Comm. Spec. Pub. 95-1.

Is the Prey Base Matched to Primary Production?

No apparent changes in primary production

Major changes in food web

- zebra mussel proliferation
- decline in deepwater benthic invertebrates

Effects of food web changes

Lake whitefish emaciation

Improved growth of Saginaw Bay yellow perch

Lake Huron

Fall Survey,
1973-91
12-m trawl

Bloater Survey,
1980-1991
21-m trawl

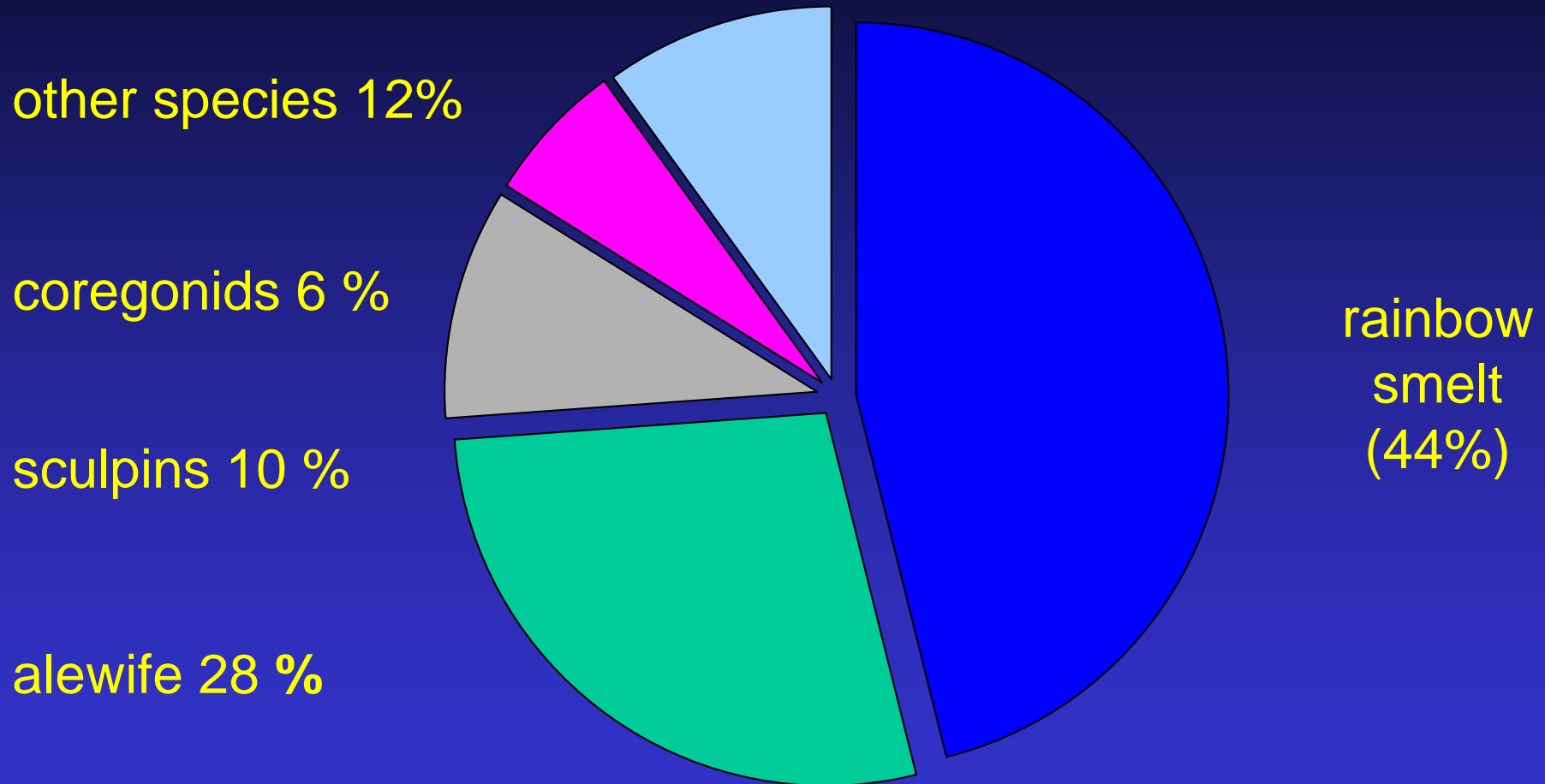
Combined Survey,
1992-99
21-m trawl



Is the Prey Base Matched to Predatory Demand?

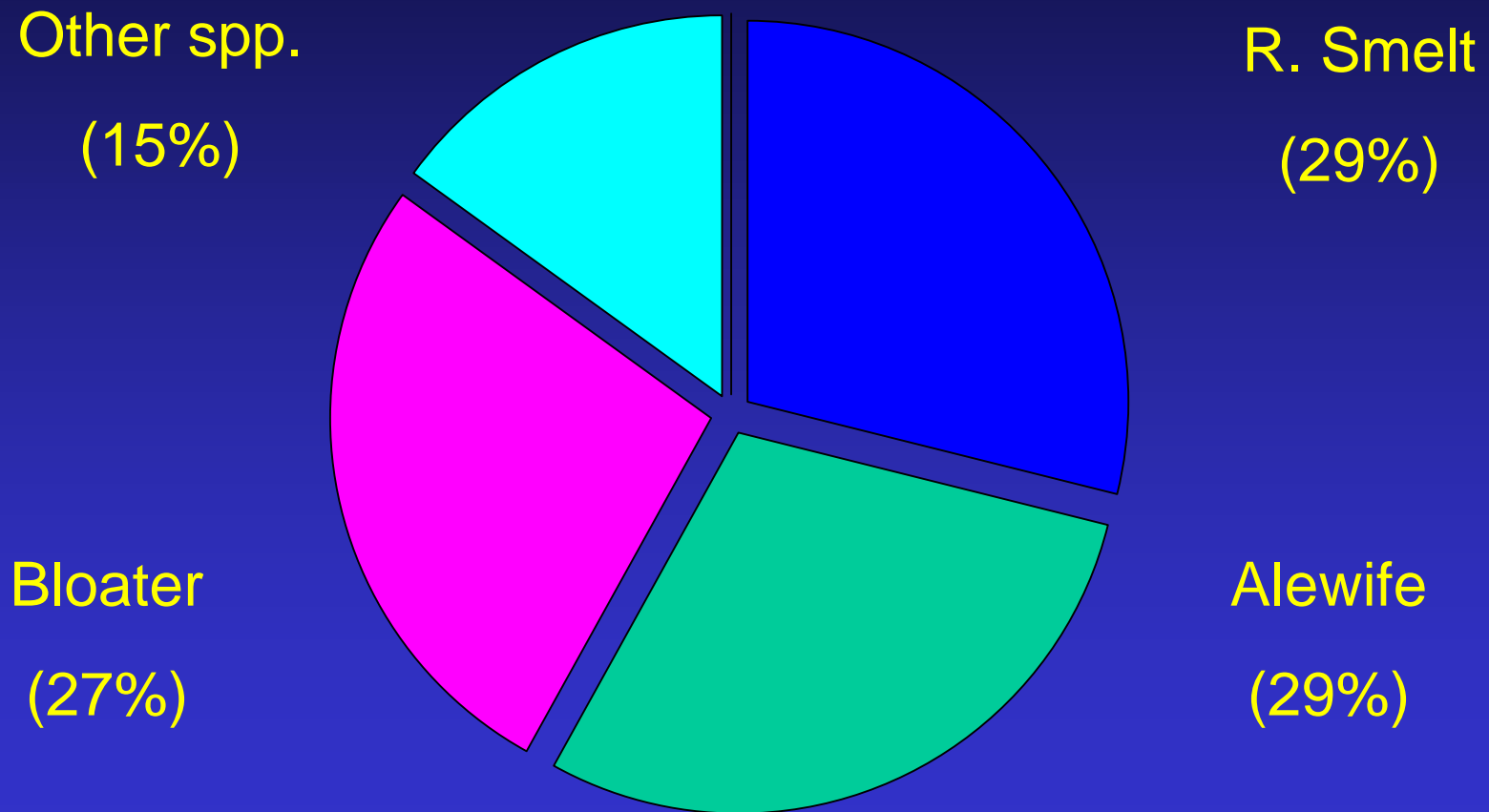
- What prey species are present?
- What species are eaten?
- Can we see effects of predation?

The Prey Community is Diverse: 32 species



Numerical Abundance

Planktivore Biomass Dominated by Three Species

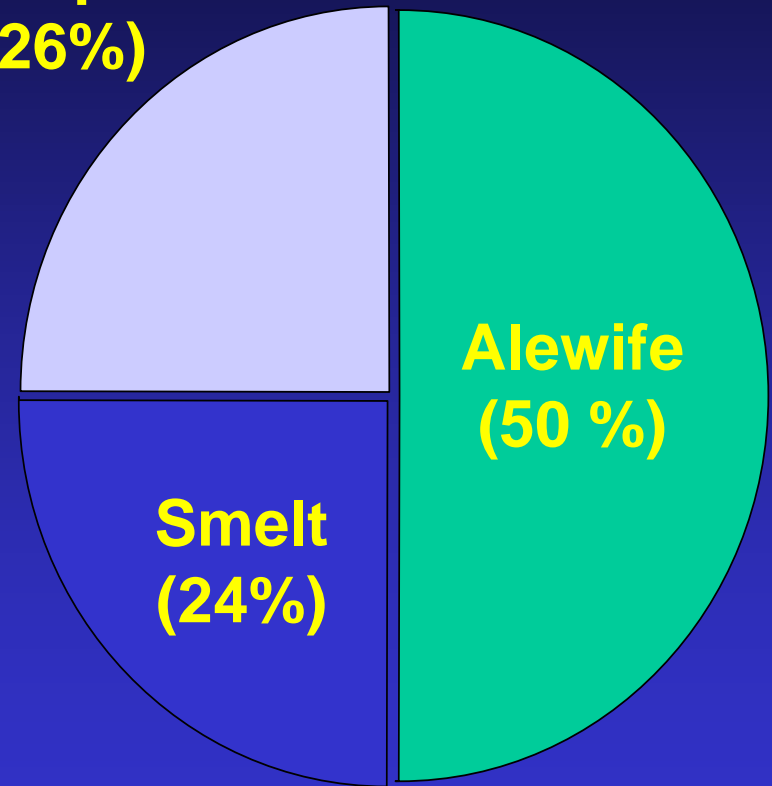


Prey Base dominated by two species!

- **Major Chinook Prey items:**

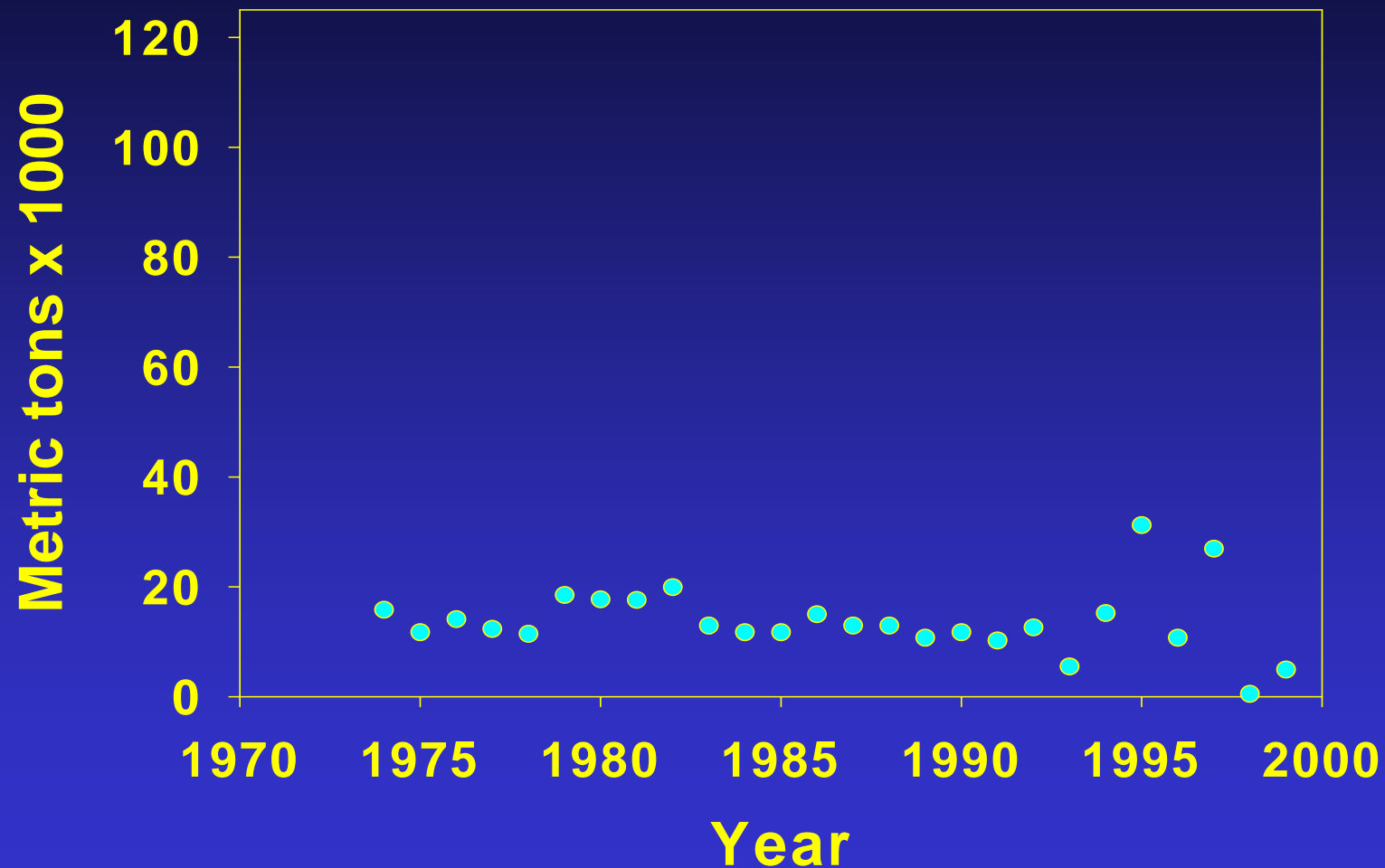
- alewife
- rainbow smelt
- sculpins, sticklebacks, other species

Other species
(26%)

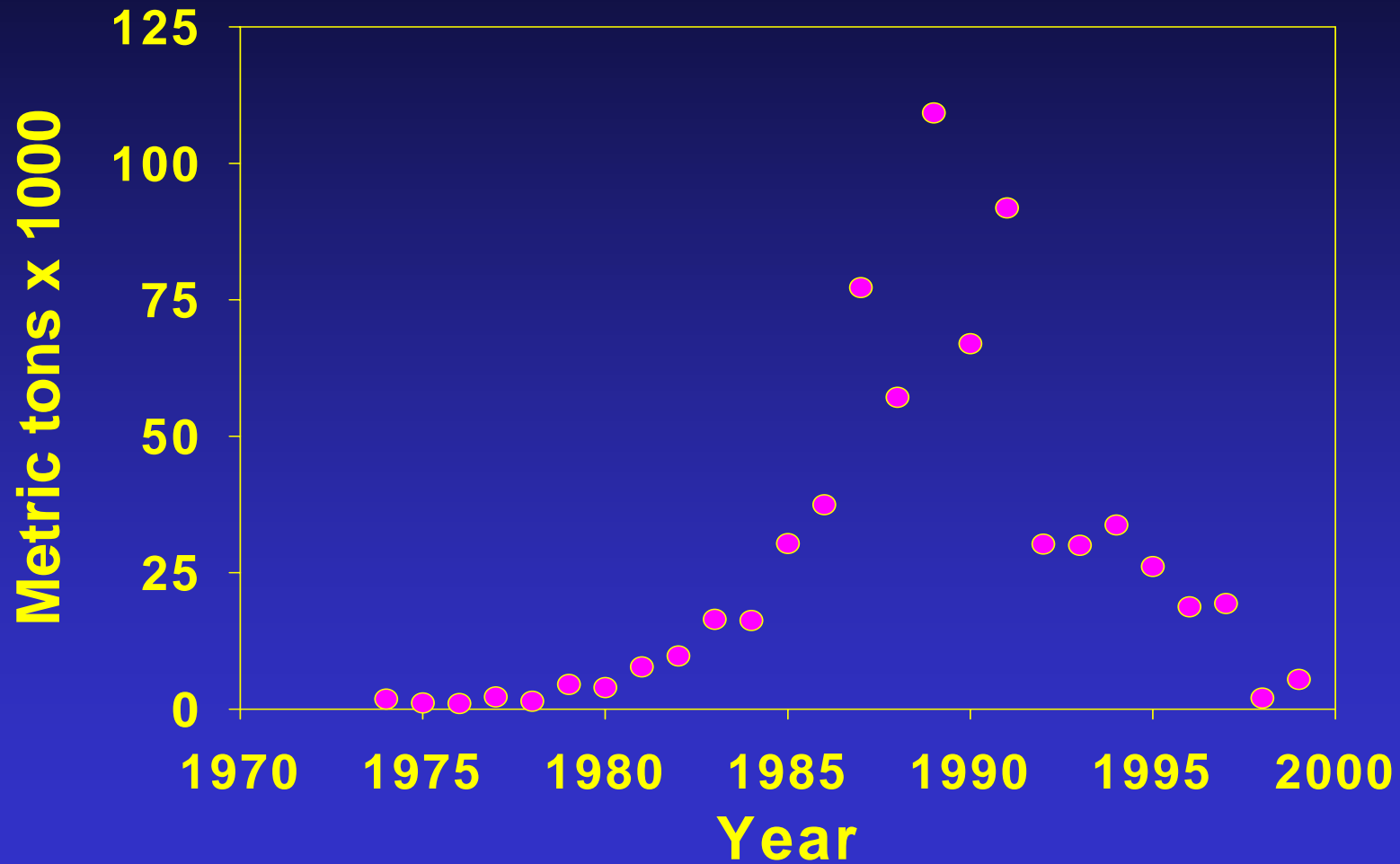


Source: Interagency chinook diet data collated by MSU

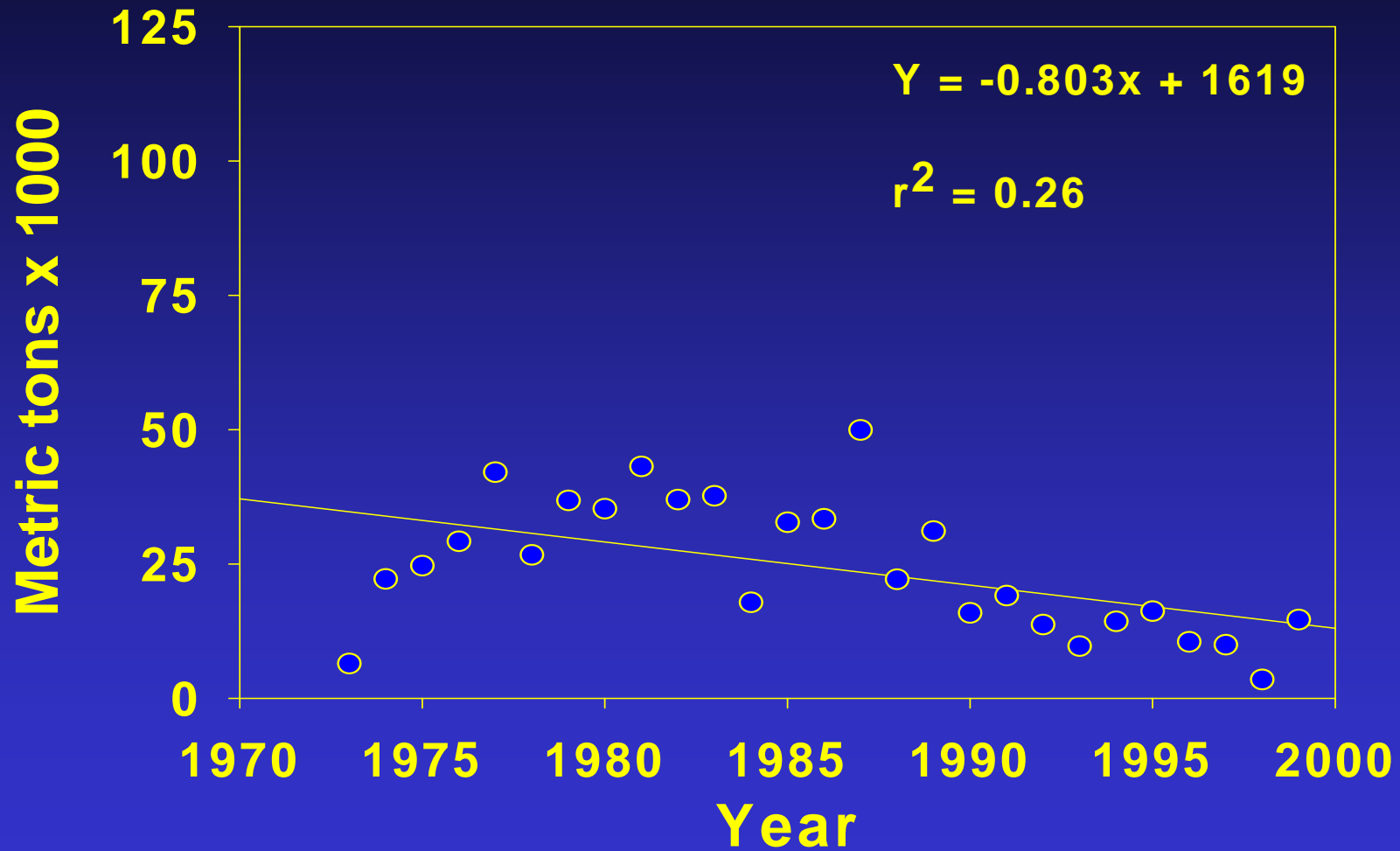
Sculpins, Sticklebacks, Troutperch



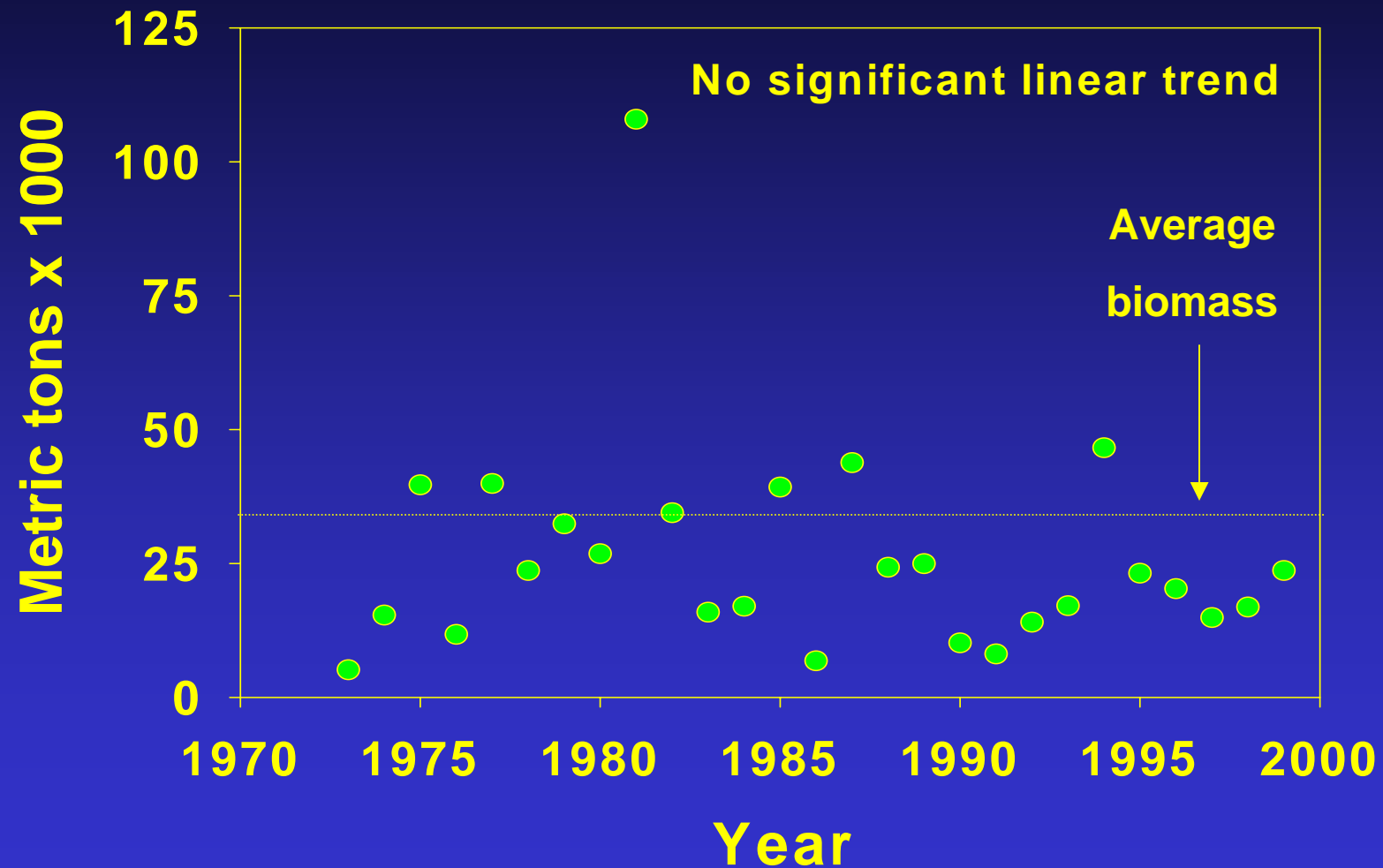
Bloater Biomass is Cyclic



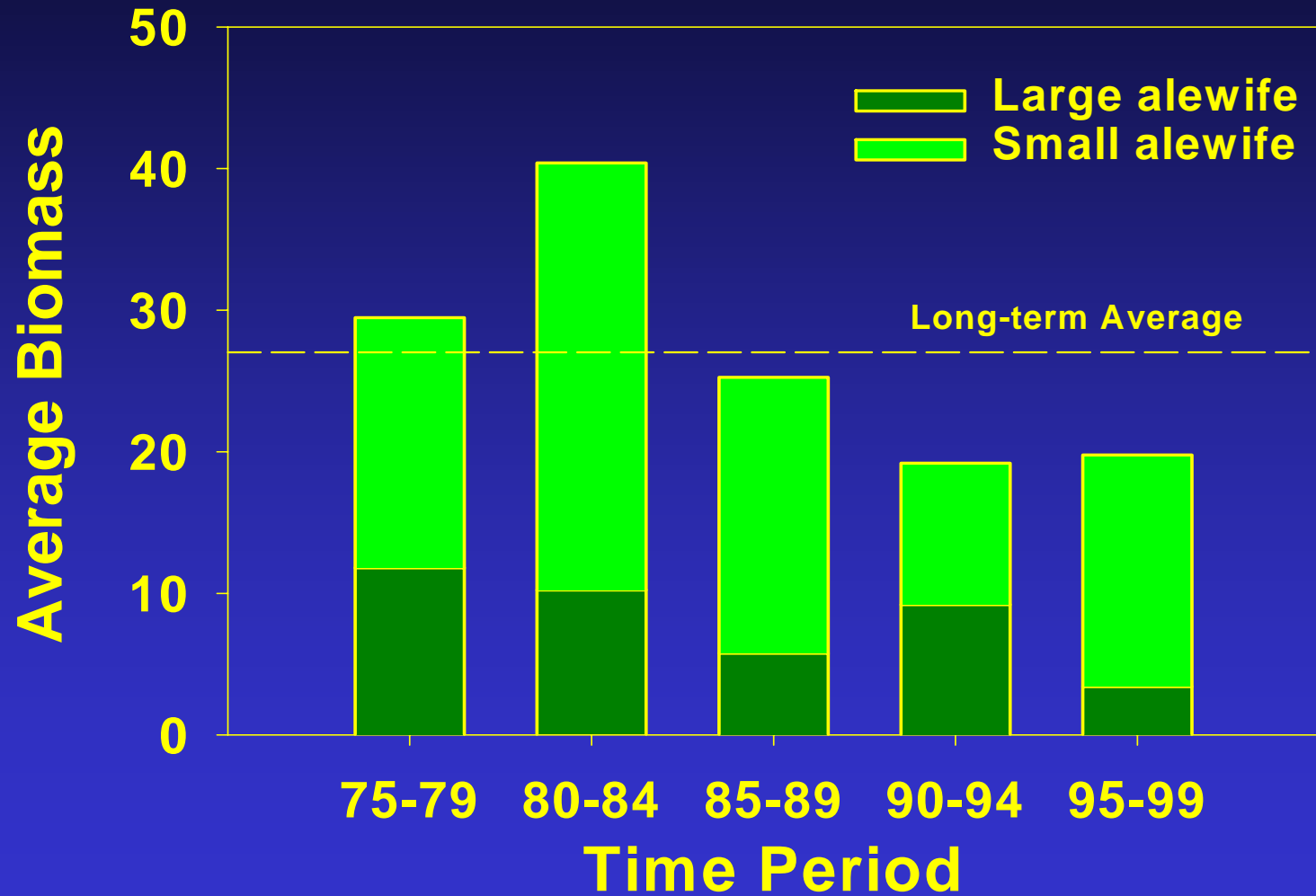
Rainbow Smelt Biomass



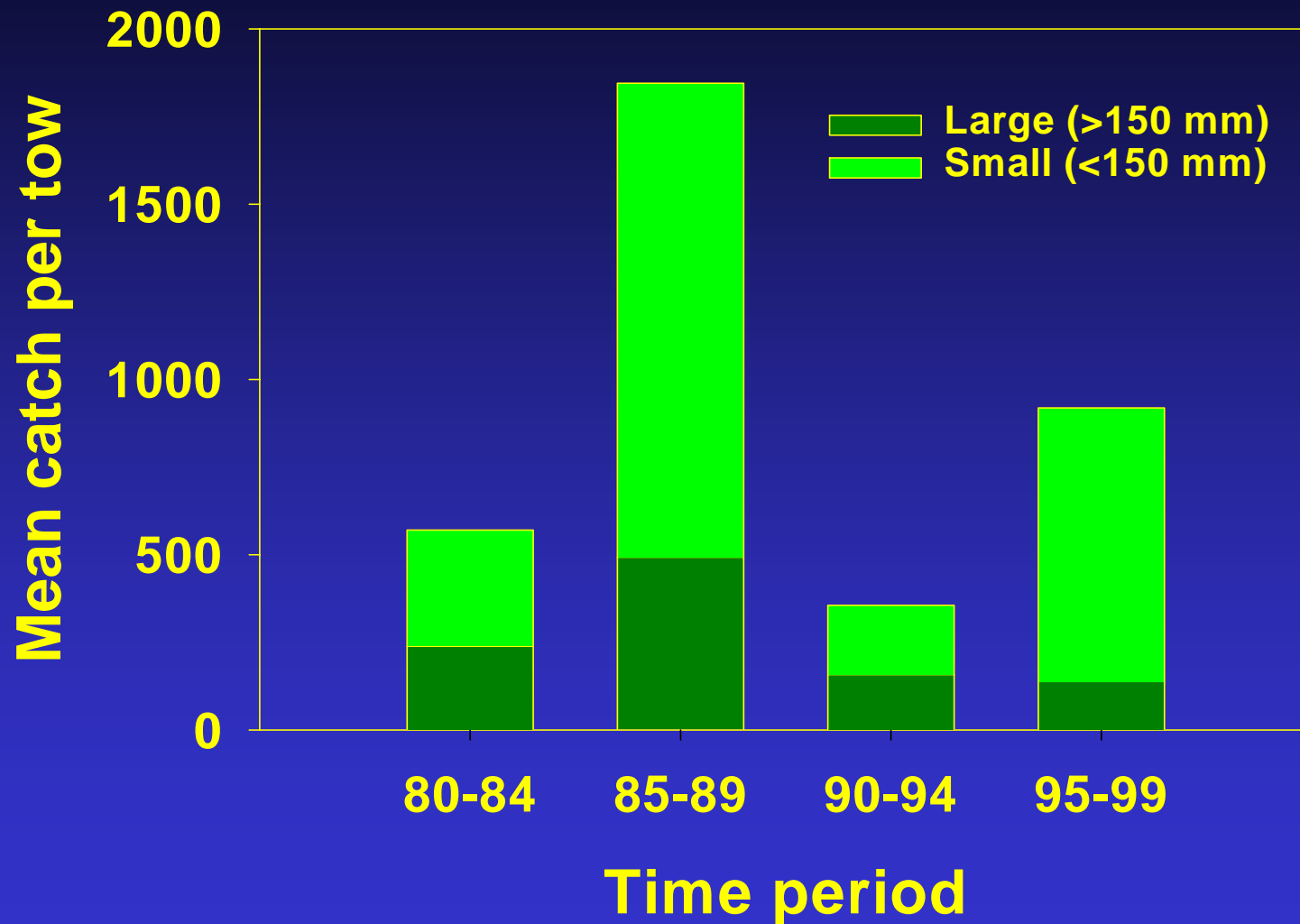
Alewife Biomass



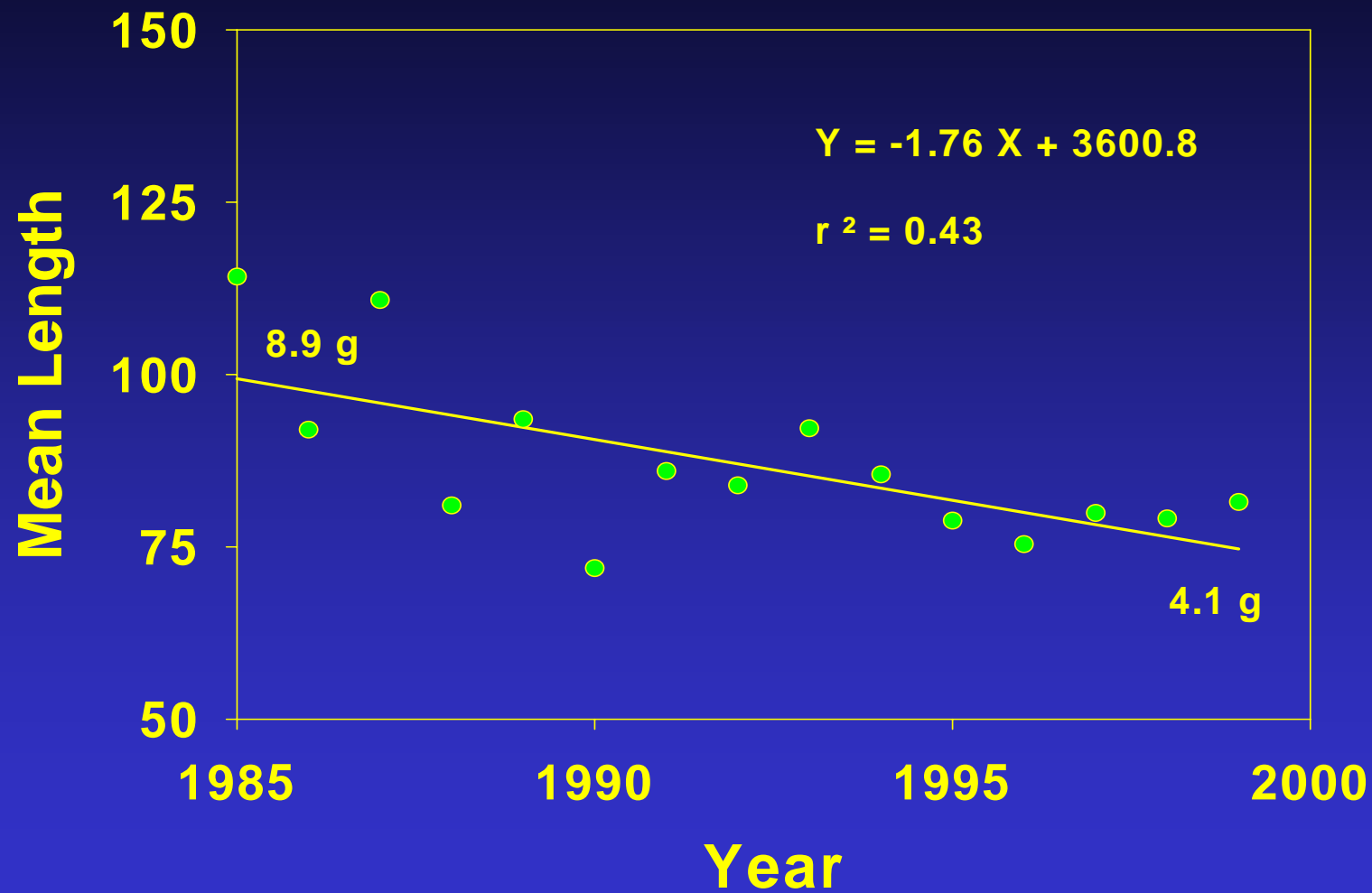
Alewife Biomass: 5 Year Intervals



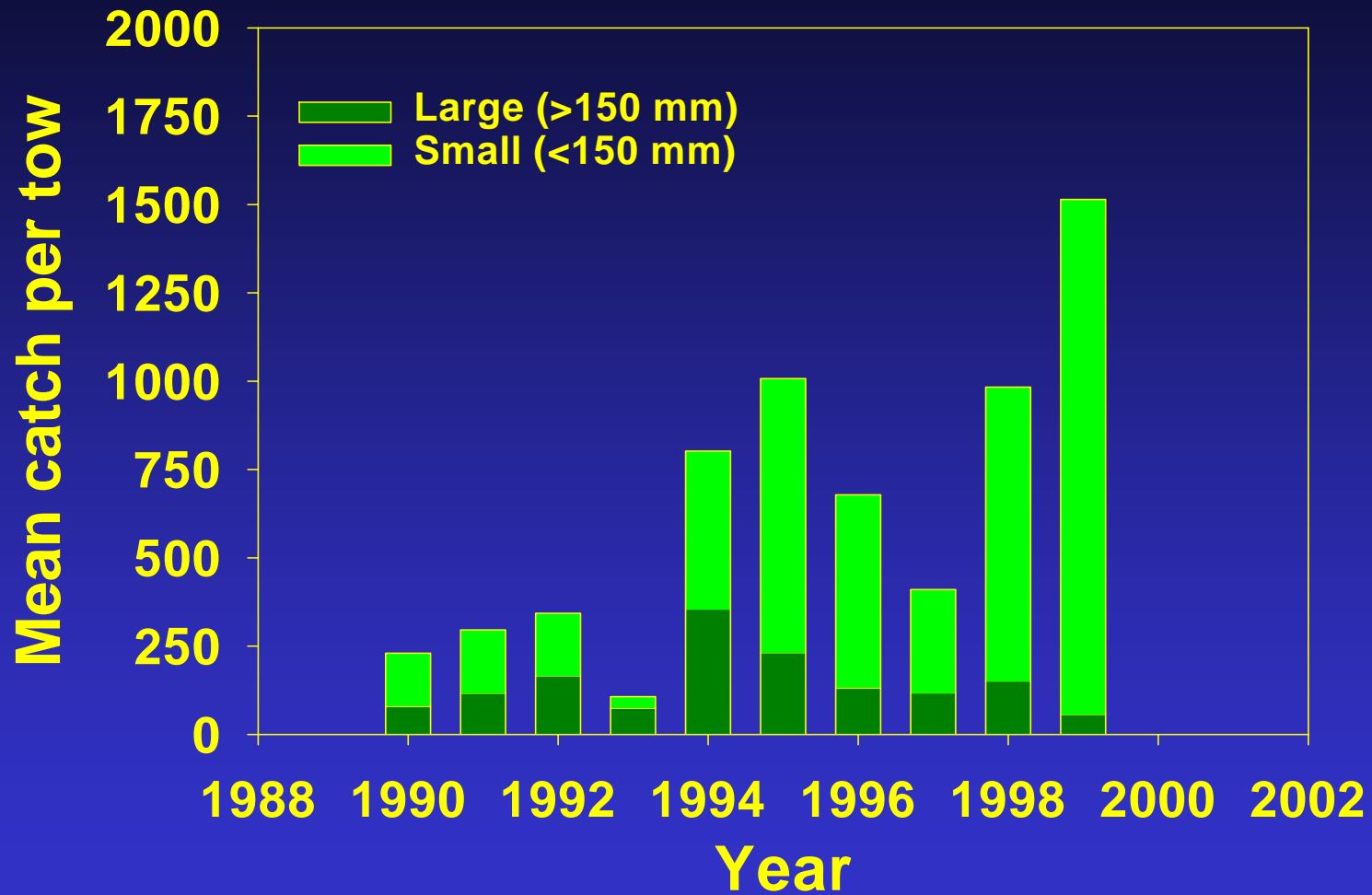
Alewife abundance



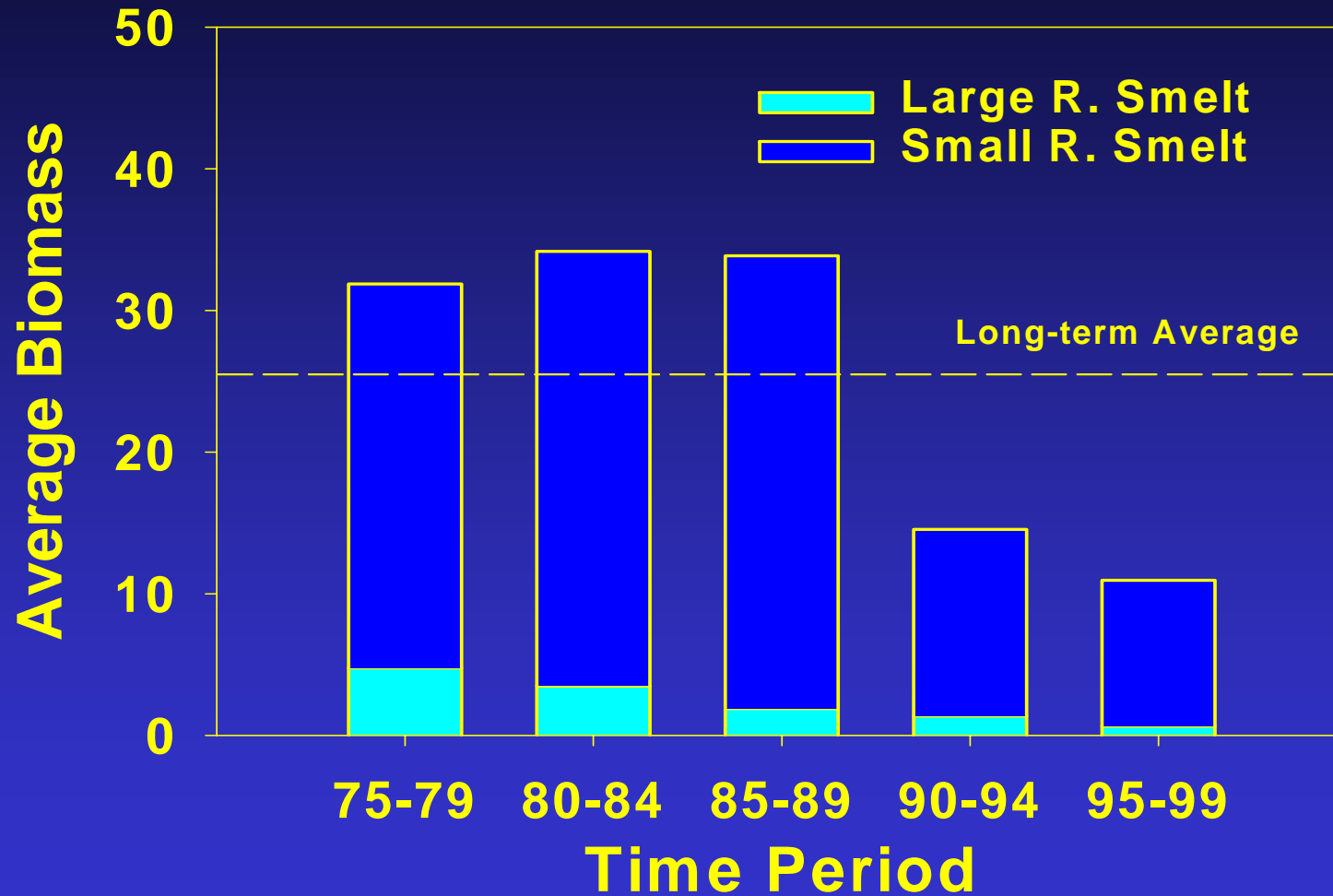
Age-0 Alewife



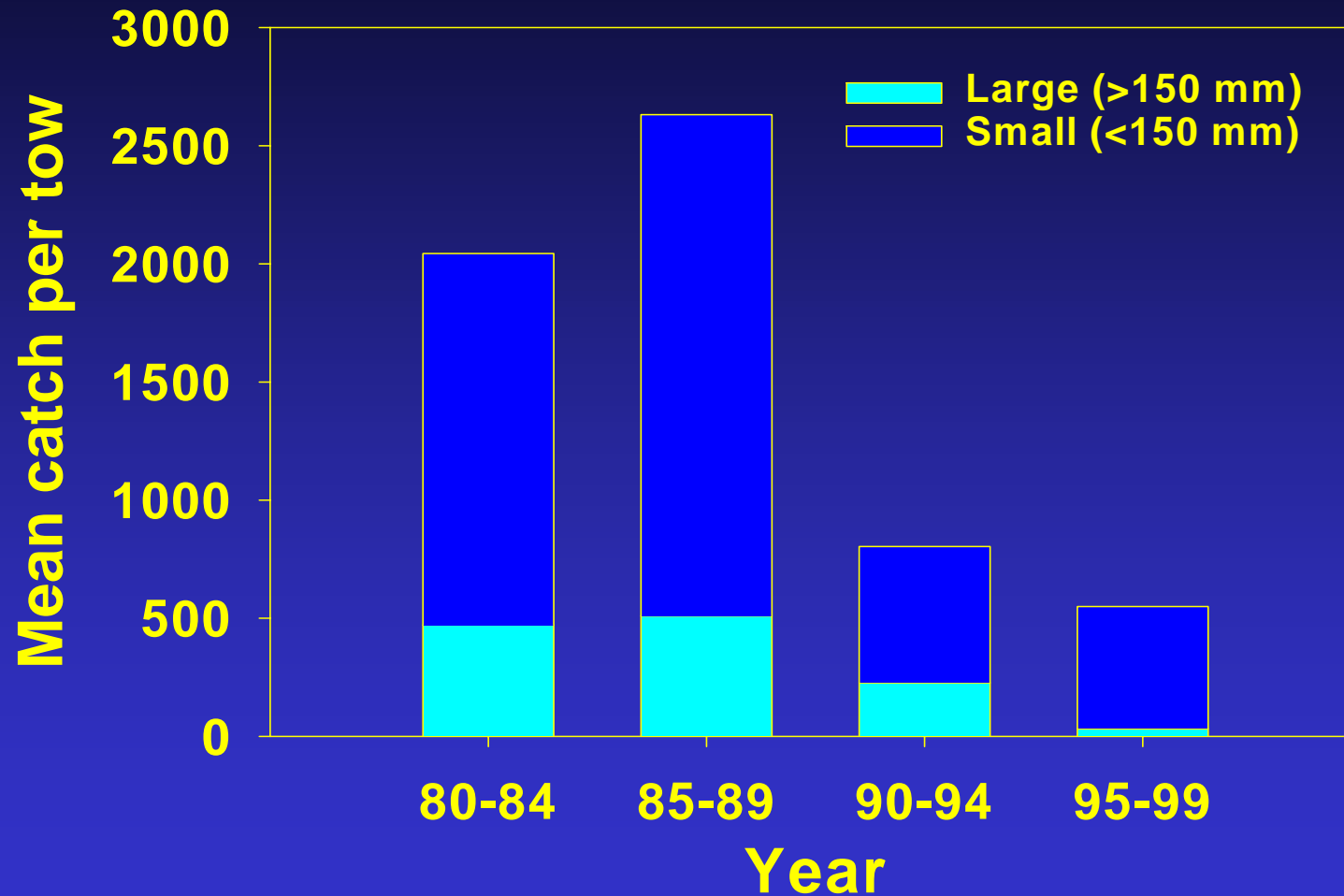
Alewife: 1990-1999



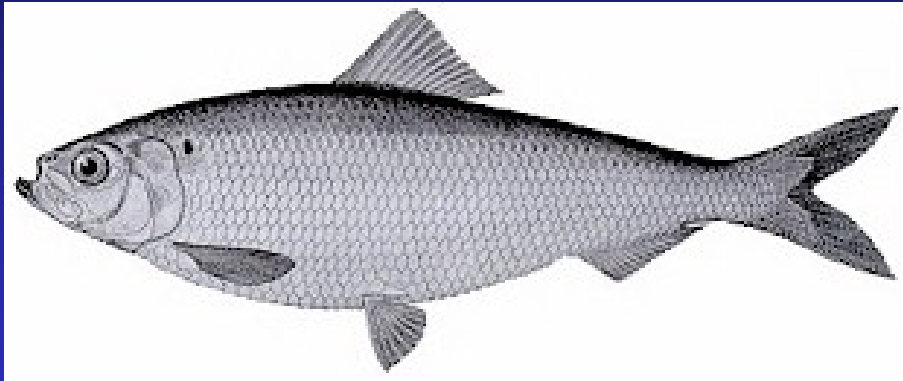
Rainbow Smelt Biomass: 5 year intervals



Rainbow Smelt Abundance

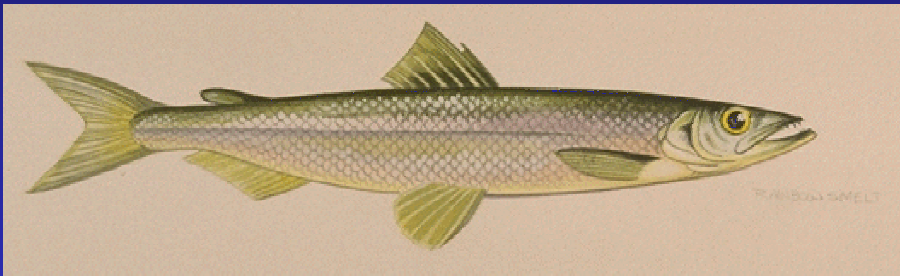


Alewife as Prey



- **Prey availability may depend on age-0 fish**
- **Year class strength**
 - Good year: small prey
 - Poor year: few prey
- **Growth may be important**
 - Affects prey biomass
 - overwinter survival
 - Size-selective predation

Rainbow Smelt as Prey



- **May no longer be a resource for large predators**
 - Too rare
 - Very few large fish
- **Scarcity may increase pressure on alewife**

Conclusions

- **Major changes in the food web**
- **Total planktivore biomass decreasing**
 - Decline in bloater not due to predation
 - Declines in R. smelt and alewife consistent
 - with predation, but growth may be important
- **Prey size structure declining**
 - Few large alewife or rainbow smelt
 - Trends are consistent with predation

Prey Fish Objectives

- **May be difficult to attain (numbers)**
 - Food Web changes
 - Predator demand high
 - Pelagic planktivores declining
- **Other Objectives may be enhanced**
 - Greater proportion of native species in biomass
 - Reduced interactions with exotics
 - New approaches now possible